The Wonders of Electricity ... an adventure in safety

Teacher's Guide

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INTRODUCTION

Hydro One created this interactive CD-ROM adventure to assist the educator wishing to teach students about safety and respect for electricity. It is directed at grade levels 5 through 8.

The program is structured to provide several teaching options. (Your choice will depend, at least in part, on the number of computers available.)

- With guidance from the teacher, students can work through the program at individual work stations.
- Students can work in small groups, each at its own computer work station.
- Using just one computer station, you may prefer to run the program demonstration style, and have the class make collective safety decisions for each of the lessons.

Whichever approach is taken, frequent class discussions are recommended, so students can pose additional questions, share understandings and explore how they will use what they have learned. If all students work on the same lessons, group discussion can follow the completion of each section.

Included in the program is a take-home component that provides students with a quick checklist of the lessons they have completed. To generate these "Detective Notes" you will need a printer connected to your computer (the quality of the printout will depend on the type of printer you have.)

WARNING

THIS PROGRAM CONTAINS SCENES THAT MAY BE UPSETTING TO SOME.

Note to teachers: In order to help students gain an appreciation of the seriousness of electrical hazards, several of the safety lessons in the program are explained with the aid of video footage showing a person receiving an electrical shock and its immediate effect. The lessons using such video footage are identified in a flow diagram found under "How the Program is Structured" in this Guide.

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THE PROGRAM AS A TEACHING TOOL

"The Wonders of Electricity... an adventure in safety" allows the teacher to take students on a series of first-person educational adventures. Cast as the hero of the story, the student, or the group, navigates through four locations in the town of Hazardville— the hydro substation, Power Park, Circuit Court and Millie Watt's residence— to rectify twelve hazardous situations.

Along the way, students discover new words and concepts, along with important information about how electricity works, and how to use it safely. Each safety challenge the student encounters is resolved through a series of activities that support visual, auditory and kinesthetic learning. A narrator, Chief Safety Investigator Millie Watt, assists the teacher in guiding students through each of the following steps:

1. Presentation of the Safety Challenge

Every good story needs a villain and this one is no exception. In each of the safety lessons, the shadowy figure of our villain, Alec Trick Hazard, is glimpsed causing an electrical hazard and endangering the citizens of Hazardville.

2. Responding to the Challenge

Students are given the chance to test their knowledge by choosing the safe solution to the presented safety challenge. They will be fully absorbed, since their efforts are needed to save the people of Hazardville.

3. Noting the Safe Choice

Once the safe choice is made, the student's solution is reinforced by the narrator, who then describes the hazard and its solution. The safe solution is also presented visually on the screen.

4. Understanding Why

Students watch a flow diagram, or a brief video clip (approximately 30 seconds), as the narrator reinforces the lesson by explaining the electrical hazard in more depth, and describing why and how the safe solution prevents injury.

5. Playing the Review Game

Various types of activities— word scrambles, definition games, mazes and picture puzzles— are used to assist students in deepening their understanding and making the safety lesson their own. These activities also help reinforce some curriculum objectives such as spelling, space relations, computer skills and electrical terms definitions. If the program is being run by a group of users, students will take turns playing the review games.

6. Notebook Entry

Students open their "Detective Notes" and watch as the safety lesson, in words and pictures, is entered into their personal notebook.

Note to teachers: For a complete listing of the twelve safety rules, print out the "Detective Notes."

SUPPORTING EDUCATIONAL COMPONENTS

Program components in support of additional educational activities are accessible from the Main Navigation Screen (please refer to Diagram A in the section titled, "How the Program is Structured"). In addition, students can access the "Definition Diner" and their "Detective Notes" during the program by opening the tool belt symbol, and clicking on the appropriate icon.

Definition Diner

A glossary of electricity-related terms is presented as the town's diner, complete with a table-top jukebox from which students can make their selections. If students navigating through Hazardville encounter an unfamiliar term, they can use the tool belt to go directly to the diner for a definition. In order to entice students to browse the glossary, some of Chief Investigator Millie Watt's unique expressions appear here and there between the electrical terms.

Detective Notes

The Detective notes provide a personalized record of learnings based on the student's adventure. The notes can be printed out for students to take home after completing the program. Print-outs requested before the user has navigated through all the safety lessons will include only those lessons the user has completed so far.

Students may be encouraged to use their notes, with the help of parents, as a basis for an at-home electrical safety report. A Certificate of Merit is provided as a keepsake for students who have successfully mastered all twelve safety lessons.

The teacher may wish to provide students with the local telephone numbers to call to report an electrical hazard or emergency.

Hydro One Internet Link

A direct link to the World Wide Web, available from the main navigation screen, encourages further exploration. For step-by-step instructions on how to link to the Hydro One website please refer to the Web Link Instructions section of the Teacher's Guide.

Reward Games

A collection of additional games is available as a reward to students who have finished making Hazardville safe. The games use electricity-related words and pictures.

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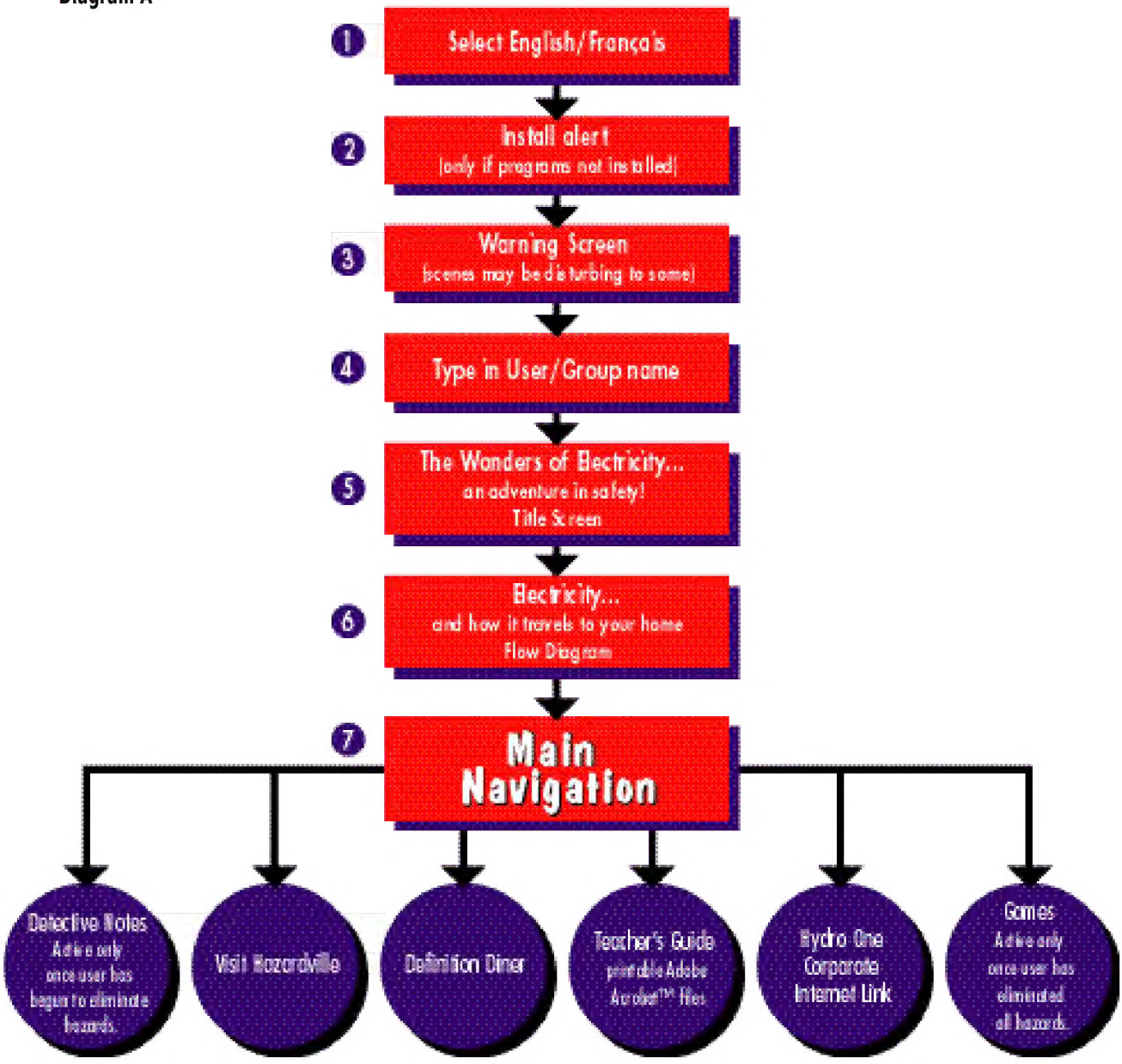
HOW THE PROGRAM IS STRUCTURED

Diagram A



HOW THE PROGRAM IS STRUCTURED (cont...)

Diagram A

A. Getting to the Main Navigation Screen

Flow diagram "A" illustrates how the program components are organized.

1. When the CD-ROM is inserted, it prompts the user to choose between "English" and "Français."
2. If QuickTime™ 4.1 is not yet installed in the system, the program alerts the user and guides him/her through the installation procedure.
3. A warning appears that reads "The circumstances you are about to explore are based on actual events. These were the experiences of real kids, like yourself, and their families. Unfortunately, only a few of them survived to talk about what happened."
4. The program is customized according to the name that user(s) enter here. Whenever the CD-ROM is restarted at the same computer, it will keep track of what hazards were eliminated during their previous session.
5. The title screen introduces the program.
6. A brief overview, in the form of a flow diagram, explains how electricity is generated, transmitted and distributed to the consumer.
7. The Main Navigation screen gives students and teachers access to all the program components, with one exception. Users cannot access the GAMES until they have completed all twelve safety lessons found in the VISIT HAZARDVILLE component.

   The contents of program components are described under the section titled "The Program as a Teaching Tool."

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Diagram B

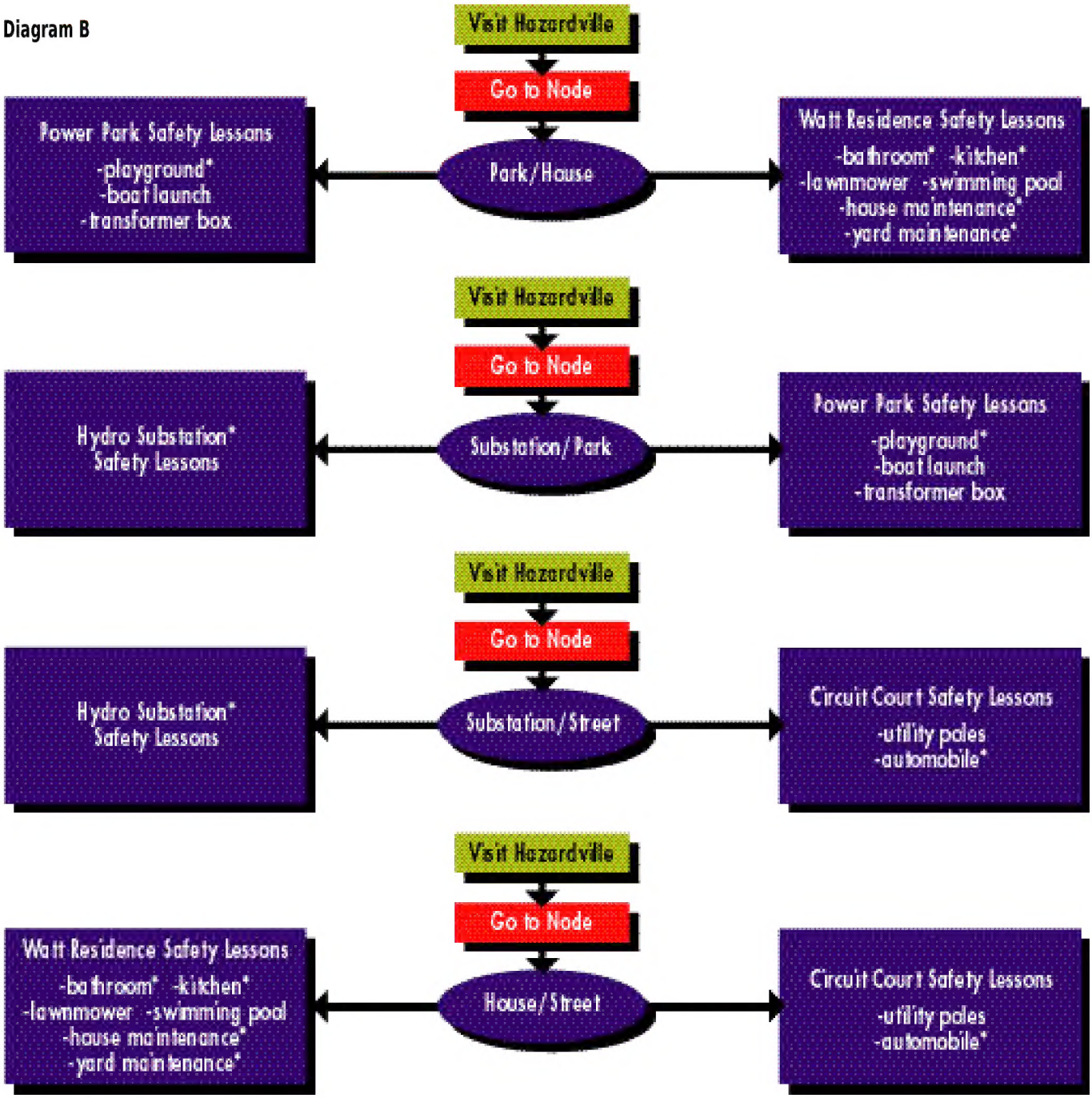

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Diagram "B" shows how the main program component, the Visit to Hazardville, is structured, and shows you where to locate each of the safety lessons. Four separate Hazardville locations can be accessed from four "street corners," shown as nodes on a map of the town. Each street corner is situated between two locations, so that each of the nodes allows the user to choose between two sites.

To assist the teacher, the safety lessons illustrated with live video footage are indicated with an asterisk*. These scenes of persons receiving electrical shocks may be upsetting to some of the students, but are nevertheless very important to help children appreciate the seriousness of electrical hazards. You may want to offer a few words of guidance before students see this material, and respond to any concerns that arise.

Diagram C

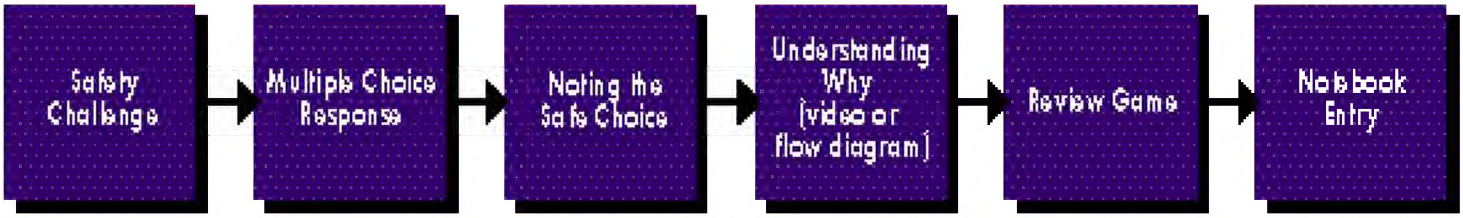

Diagram "C" illustrates how each of the safety lessons is structured. The steps are described under "The Program as a Teaching Tool," to be found elsewhere in the Guide.

1. Safety Challenge
2. Multiple Choice Response
3. Noting the Safe Choice
4. Understanding Why (video or flow diagram)
5. Review Game
6. Notebook Entry

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WHAT YOU NEED TO RUN THE PROGRAM AND HOW TO START

IBM COMPATIBLE USERS

You need:

- Pentium II 233 MHz or greater
- Minimum 32 MB of RAM running Windows 95
- 256 Colours at 640 x 480
- 8x CD-ROM drive
- 100% Sound Blaster compatible card

You also require QuickTime™ 4.1 or later to be installed to play the CD-ROM. If not already present there are two ways to install QuickTime™ 4.1:

Double click SETUP.EXE from the root level of the CD-ROM. Setup will install the necessary components for this application to run correctly, such as QuickTime™ 4.1 and Acrobat™ Reader 4.0. It will also install a Program Group for Windows 95 users accessible from the Program Menu (from the start button).

or

Double click on QT4.1.EXE in QT41WIN directory on this CD, and follow the directions on the screen.

To start the program:

If SETUP.EXE has not been executed then double click HYDRO.EXE from the root level of the CD-ROM.

or

If SETUP.EXE has been executed then double click the "Hydro Safety" icon from the Program Menu, from the Start Button.

MACINTOSH USERS

You need:

- Power Macintosh 100MHz
- System 8 or later
- 32 MB of RAM
- 256 colors at 640 X 480
- 8x CD-ROM drive

You also need QuickTime™ 4.1 to play the CD-ROM. If it is not already installed, follow these instructions to install QuickTime™ 4.1:

1. Open the QuickTime™ 4.1 folder on the CD.
2. Copy the contents into the System folder on your hard drive.
3. Restart the computer.

To start the program:

1. Double click on the Hydro Safety icon.

FURTHER QUESTIONS?

If you would like further information, have questions not answered in this guide, or encounter technical difficulties, please contact webmaster@ HydroOne.com.

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DETECTIVE NOTES

- If a cat dimbs up a utility pole, let it be. It will come down when it is hungry.
- If a car hits a hydro pole or takes down power lines, stay well clear. Call to the people inside to stay put while you report the accident and electric hazard.
- Always fly your kite in wide open areas far from power lines.
- Always launch a boat in a clear spot far from power lines. When anyone is moving a boat, look up, check for power lines and alert everyone.
- If you see a transformer box with an open lock or an open door, keep clear and call Hydro to report the problem immediately.
- Always stay outside of hydro substations. If your ball falls inside, call Hydro for help.
- Make sure there are ground fault circuit interrupters in your bathrooms and use electrical appliances cautiously.
- If there is a problem with an electrical appliance, pull the plug right away.
- Be careful with outdoor appliances. By law, new exterior outlets must have ground fault circuit interrupters.
- To avoid accidents, swimming pools should be located far from power lines. If necessary, you can ask Hydro to move power lines before you build.
- For repair jobs that may not be absolutely safe, hire a professional who is qualified to work around electricity.
- Branches growing near power lines are dangerous. Tree houses should always be built far from hydro wires.

DEFINITION DINER TERMS

ace

Chief Investigator Millie Watt's way of describing someone who's the best at something.

amp

The name of the units used to measure an electrical current. Also called an ampere.

amperage

The strength of an electric current. Just as you would need a greater flow of water to put out a house fire than you would need to fill a glass, you need a greater flow, or amperage, of electricity to operate a stove than you need to operate an electric toothbrush. Amperage is measured in units called *amps, or amperes.

appliance ground

A *conductor that connects the covering of an appliance to the ground. It can help prevent a person touching the appliance from getting an *electrical shock if something goes wrong with the insulation covering the live circuits.

atom

A small particle that makes up matter. All atoms have a positively charged *nucleus containing protons and neutrons, and negatively charged orbiting *electrons.

barriers

Rubber gloves, warning signs, fences and other items that can protect people and equipment from *electrical hazards. They guard against contact with live circuits or prevent a second point of contact in case contact is made. The more barriers are installed, the lower the risk of injury.

bird dog

Chief Investigator Millie Watt's way of describing someone who works very aggressively.

brain picker

Investigator Millie Watt's name for someone who learns quickly, by listening to the experts.

bushing

The section of the *transformer that connects the high voltage wire to the transformer.

chump

One who's easily fooled. Chief Investigator Millie Watt says,"don't be one!"

circuit breaker

Part of a circuit, which, like a *fuse, protects *conductors from overheating and possibly causing fires. It activates when there is too much current, stopping the flow of electricity. It usually has a button that can be pushed to reset the device. Circuit breakers in hydro substations may be very large pieces of equipment.

closed circuit

An electrical circuit that is complete and allows the *electricity to flow through it.

conductor

Any substance which has the ability to transmit an electrical charge. Metals, water and many other materials are good conductors of electricity. Materials that normally do not conduct electricity, like dry wood and rubber, can also become conductors if they are wet or dirty.

conduit

A tube, containing and protecting, electrical cables.

control system

The methods and materials used to keep the electrical system safe. Fences to keep people out of electricity *substations, towers that keep power lines high above the ground, *insulators around electrical wires on appliances that people touch and use, are all part of the control system used to keep *electricity safe.

cork buster

Chief Investigator Millie Watt's way of describing a problem that requires much thought to solve.

current

The flow of *electrons, or electricity, through a *conductor. It is measured in *amps, or amperes.

cut some zees

Chief Investigator Millie Watt's way of saying, "go take a nap!"

di-electrical safety boots

Electrically-resistant footwear that reduces the risk of the current travelling to ground and completing the circuit, when someone working around *electricity accidentally touches a *live circuit.

dig

Chief Investigator Millie Watt's term for "understand," as in "can you dig this?"

distribution station

A type of hydro *substation, where the *voltage of electrical power is reduced, making it suitable for delivery to consumers in homes, schools, factories and businesses, and to equipment such as street and traffic lights. The distribution wires are either overhead, on wooden poles, or buried underground.

electrical breaker

A spring-loaded safety switch that is activated by excess *current, and breaks the circuit. It can be reset.

electrical circuit

A path that electricity can take without being stopped.

electrical hazard

Any situation that creates a risk of someone getting in the middle of the electrical *control system or between the *control system and the ground. When electricity can enter and leave the body, when a person becomes part of an electrical circuit, they can receive an *electrical shock, and be injured or even killed.

electrical meter

A device, usually belonging to the hydro company, that measures the amount of electricity the customer uses in kilowatt-hours.

electrical meter base

A device furnished by the hydro company that is attached to the customer's home, and holds the *electrical meter.

electrical service panel

The electrical panel installed in your home. This is where the house circuits are connected to the wires coming out of the *meter base. This panel may contain *circuit breakers or *fuses.

electrical shock

The effect that a sudden discharge of *electricity has on a person or animal, usually including stimulation of the nerves and contraction of the muscles.

electricity

Electricity is difficult to define, and we only know it is there because of the effects it produces. Static electricity, or an "electric charge," may appear on an *insulator when it is rubbed. Current electricity, or an electric current, is electricity moving through a *conductor. The presence of an electric current may be detected by: the magnetic effect it produces, the production of heat, the chemical effect if the current passes through an electrolyte and the production of sparks.

electron

The only moving part of an *atom, possessing a negative (-) charge moving in orbit around the *nucleus.

energy

The capacity to do work. With reference to electricity, energy is the quantity of electric power used over a specific length of time, and measured in watt-hours, or kilowatt-hours. For example, a 100-watt light bulb turned on for 10 hours, would use 100 watts x 10 hours = 1000 watt-hours, or 1 kilowatt hour.

fission (nuclear)

The splitting of an *atom to release heat and light energy.

flathead

Chief Investigator Millie Watt's name for Alec Trick Hazard, whom she considers not very bright.

fossil fuel power plant

A *generating station in which coal, oil or natural gas is burned to heat water and convert it to steam. The steam rotates a *turbine, which is connected to a *generator. When the generator spins, it makes electricity.

fuse

A safety device on an electric wire or at an *electrical service panel; it prevents fires by melting when a wire is overloaded, thereby breaking the *electrical circuit.

fusion (nuclear)

The imploding (crushing) of an *atom to release heat and light energy.

generating station

A station where *generators are used to make electricity. Generating stations generally use falling water, or steam made by burning fossil fuel or nuclear to power the *turbines which turn the generators.

generator

A device that turns mechanical energy into electrical energy.

grid

The network of cables distributing *power across the province.

ground fault

This occurs when *electricity finds a path to ground rather than through wires.

ground fault circuit interrupter (GFCI)

A safety device that almost instantly senses an electrical *ground fault. In a fraction of a second it interrupts, and opens, the protected circuit, and stops the flow of electrical *current before someone is hurt. Ground fault circuit interrupters should be installed in all exterior *outlets and outlets located in bathrooms or near water (near pools or hot tubs). GFCIs protect people from serious or fatal *electrical shocks.

ground gradient

A hazardous situation where electricity flows from a broken wire, or other piece of energized equipment, and dissipates across the surface of the ground. Like the ripples that form when a pebble enters the water, the "ripples" of electricity get weaker as the circles get larger and go farther out. Someone who steps into a ground gradient, and places one foot where the voltage is high and the other where it's low, will receive a shock as the current starts to flow through their body from the high to the low *voltage areas.

ground wire

A metal *conductor connected to an appliance or other device at one end, and connected to ground at the other, by something such as a ground stake or water pipe. Its purpose is to protect people who might come in contact with equipment when there is a *ground fault, by directing the *current to ground and causing the *circuit breaker or *fuse to operate.

hydroelectric power plant

An electric *generating station where falling water is used to produce electricity. Water is dropped through a *turbine which in turn rotates a *generator to make electricity.

insulator

With reference to *electricity, a non-conducting material, like rubber or glass, used to prevent the flow of *current, and *electrical shock, to anyone near that source of *voltage.

lightning

Sparks that leap through the air; made of electrical charges that occur when particles of water, ice, and air rub together in clouds.

live circuit

Any circuit that is connected to a source of *power.

moxie

Chief Investigator Millie Watt's term for bravery or courage.

nuclear power station

An electrical *generating station which uses nuclear *fission (splitting of uranium atoms) to create heat for converting water to steam. The steam drives a *turbine, which in turn rotates a *generator. When the *generator spins, it produces electricity.

nucleus

The central part of the *atom.

ohm

The unit used to measure *resistance. One ohm resistance means the material will allow a current flow of one ampere when subjected to one *volt of electric pressure.

open circuit

A circuit that is incomplete. It may contain a broken wire, or it may have been opened by a *circuit breaker, thus preventing *electricity from flowing.

outlet

A box with electrical wiring and a *socket, usually at the base of a wall, where an electrical apparatus can be connected to a source of electric *current.

overhead power lines

Conductors supplying electrical *power, that are supported by towers or wooden poles.

power

The force or energy that is at, or can be put to work.

resistance

Refers to the relative ability of a material to conduct electricity. High resistance materials such as air, porcelain and rubber hinder the conduction of *electricity and are used to help provide *barriers protecting people from unwanted *current. Low-resistance materials like aluminum and copper, are used to transmit and distribute *electricity effectively. Resistance is measured in *ohms.

rip snorter

Chief Investigator Millie Watt's highest compliment. If she calls you this, she's saying you're a truly outstanding person.

service wire

The lines connecting the hydro company's distribution system and the home.

short circuit

A circuit in which *resistance has been reduced so far that it allows a dangerously high *current to flow. Unless interrupted by a *circuit breaker, a short circuit can cause a fire.

socket

The part of an *outlet that we plug a lamp or some other electrical apparatus into.

static electricity

Electricity at rest. Usually a large number of *electrons in one place, not flowing as a *current.

substation

A fenced-in enclosure where pieces of electrical equipment are used to help in the transmission and distribution of *electricity from the *generating station to homes, schools, factories and businesses. Depending on their purpose, substations may be either *transformer stations or *distribution stations.

think box

Investigator Millie Watt's word for "brain."

transformer

Equipment that transfers electricity from one *electrical circuit to another; transformers can raise *voltage so that it travels quickly over great distances or reduce it so that it can safely enter industry, stores, and homes.

transformer station

Large hydro substations where the voltage levels of electricity are changed by *transformers. These stations will also contain other large pieces of electrical equipment including *circuit breakers, *fuses and switches.

turbine

A machine in which blades or buckets arranged in a row around a shaft are set in motion by a stream of liquid or gas to cause the shaft to rotate. This rotation can then be utilized to generate *power.

underground power lines

Electrical *conductors buried underground.

uranium

An element that is the main fuel for nuclear *fission.

vamoose

Chief Investigator Millie Watt's way of saying "leave quickly."

volt

A unit measurement of *voltage. It measures how much electrical pressure is forcing *current through a *conductor; a large industry might need 4,160 volts while homes need approximately 120/ 240 volts. The higher the *voltage the faster electricity moves.

voltage

The force that moves electricity through a resistance.

Watt

A unit of measure indicating electrical power; the wattage of an appliance for example, is an indicator of how much power it needs to run. Its symbol is an uppercase "W," it is also Investigator Millie's last name. A kilowatt is 1,000 watts.

WEB LINK INSTRUCTIONS

IBM COMPATIBLE USERS

Make sure you have a Modem, Internet Service Provider, and your computer has access to a telephone line or network connection, and you have already dialed into your internet provider with Dialup Networking for Windows 95.

Click on the internet button from the main navigation screen.

The first time you enter this screen you will need to setup a preference file, that locates your internet web browser (Netscape Navigator, Microsoft Internet Explorer etc).

Follow these steps:

1. Click on the "Find Web Browser" button, read the the instructions that follow and click "OK".
2. In the following dialogue box, locate your web browser on your hard drive. Once in the correct folder select the Web Browser application by clicking on it and then clicking "OPEN".
3. Your internet browser should then open and link to Hydro One's Home Page.

   The next time you enter "The Wonders of Electricity" you will only need to click the "Home Page" button unless you change your Web Browser, its location, or trash your "HydroOne.prf" located in your Windows directory. If any errors occur, it is recommended that this file be deleted, and simply follow the steps above to setup your new preference file.

MACINTOSH USERS

Make sure you have a Modem, Internet Service Provider, and your computer has access to a telephone line or network connection.

Click on the internet button from the main navigation screen.

The first time you enter this screen you will need to setup a preference file, that locates your internet web browser (Netscape Navigator, Microsoft Internet Explorer etc).

Follow these steps:

1. Click on the "Find Web Browser" button, read the the instructions that follow and click "OK".
2. In the following dialogue box, locate your web browser on your hard drive. Once in the correct folder, select the Web Browser application by clicking on it and then clicking "OPEN".
3. Your internet browser should then open and link to Hydro One's Home Page.

   The next time you enter "The Wonders of Electricity" you will only need to click the "Home Page" button. Unless you change your Web Browser or its location, or trash your "Hydro One Web Preferences", located in your preferences folder. If any errors occur, it is recommended that this file be trashed, and simply follow the steps above to setup your new preference file.